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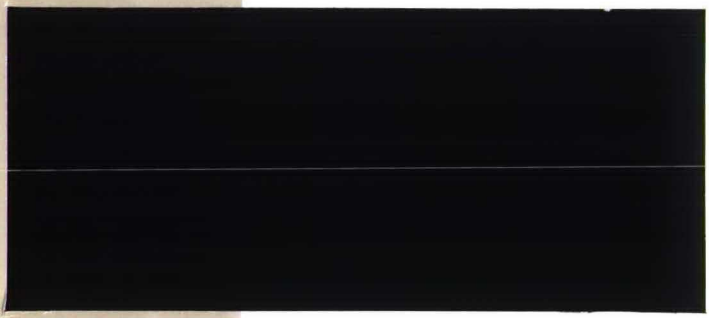

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ABSTRACT

To explore the relation between political instability and central bank autonomy, this paper develops and analyses a data base covering over 60 countries, both developing and industrial. It uses several indices of gross political influence on the central bank, created by relating the timing of changes in the bank's governor to the timing of political transitions.

Political influence is the rule rather than the exception. In periods shortly after political transitions, up to about six months according to tests reported in the paper, the governors change more frequently than at other times. This pattern appears for industrial as well as developing countries, although the latter group has a higher average frequency of turnover and less central bank autonomy. The degree of political influence is also revealed by the fraction of political transitions that are followed within six months by a replacement of the central bank governor. This indicator of central bank political vulnerability is higher for developing countries and is especially high for those that experienced one or more changes between democratic and authoritarian regimes.

The paper also examines how this measure of central bank vulnerability correlates statistically with inflation and its variability, and with real growth and real interest rates. The differences in vulnerability of the central bank to political instability, in political instability itself, and in central bank turnover in non-political periods seem to be a major part of the explanation for why the developing countries on average have higher and more variable inflation than industrial countries. These variables also help explain differences in real growth and in interest rates.

I. INTRODUCTION

Economists and policy makers generally feel that the degree of autonomy of the central bank (CB) from political authorities is an important determinant of policy choices and of economic performance. Empirical verification of these presumptions has been difficult, however, because the autonomy of the CB depends on many attributes which are not easily quantified. Most previous studies have used legal indices from CB charters to quantify the autonomy of the CB (Parkin (1987), Grilli, Masciandaro and Tabellini (1991), Alesina and Summers (1993)). These measures help account for cross country inflation differentials within industrial economies but not within developing countries. The lack of association between inflation and legal CB independence in developing countries is due to the small degree of association between actual and legal independence among those countries.[1] Hence more behavioral indices of independence are called upon. Cukierman, Webb and Neyapti (1992) and Cukierman (1992) made an initial step in this direction by using the actual average term in office of the governor as a proxy for central bank independence in developing countries.[2] This paper presses the inquiry further by taking account how turnover

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[1]Within industrial countries the frequency of replacement of a CB governor in periods which are within three months of the time he should have been replaced according to the law is more than ten times higher than the same frequency in other periods. The same ratio in developing countries is only 2.2.

[2]They found a significant negative association between this proxy and inflation across developing countries. The use of this proxy is based on the presumption that below some threshold a shorter term in office of the chief executive officer of the bank is associated with lower CB independence. It should be noted, in this context, that actual terms in office in developing countries are substantially lower than in industrial countries. Cukierman 1994 shows theoretically how the expected length of tenure of the CB governor relates inversely to inflation, via the governor's effective rate of time preference.

of the governor relates to political events.

A variety of research -- theory, case studies and statistical analysis -- shows that political instability worsens macro-economic policy and outcomes (Edwards and Tabellini 1992; Haggard, Kaufman and Webb 1992; Haggard and Webb 1994). The effects are strongest on inflation, but other variables such as growth and the real interest rate are also affected. Some of this effect may come from the direct effects of political change on policy, particularly fiscal. Some also comes from the effect on institutions, such as the central bank, and on their ability and incentive to follow policies for the long-run benefit of the economy. So one of the broader questions on the research agenda concerns the relative importance of different channels through which political instability influences economic outcomes. Other underlying questions are whether and how political instability affects institutions like the central bank. It seems likely that different kinds of political instability would have quite different effects. If political changes reflected changes in basic attitude toward economic policy or if they were traumatic and irreversible for the politicians involved, then the instability would motivate politicians to control the central bank tightly and keep it at their disposal to help them stay in power. On the other hand, if the political changes were alternations in power of two or three parties that shared a consensus on many basic tenets of economic policy, then they might agree to grant the central bank considerable autonomy to pursue price stability, so that aspect of economic policy, on which they agreed would not suffer from the political contests over other issues. These questions motivated the data collection and analysis in this paper, although it does not provide definitive answers to all of them.

This paper presents new behavioral indices of gross political influence on the central bank. The indices focus on the propensity of the chief executive officer of the bank to lose his office following a political transition. The data base and the indices derived from it were designed to address the following questions which are related to the broader questions set forth in the previous paragraphs: 1. Is turnover at the CB significantly different shortly after political transitions than in other periods? 2. What is the appropriate cutoff between political and non-political periods? 3. Are there systematic relationships between the political vulnerability of the CB, on the one hand, and the level of economic development and the type of political regime on the other? 4. Are there systematic relations between the political vulnerability of the CB and measures of economic performance such as inflation, growth and interest rates?

The first question is answered by comparing the frequency of governor changes in periods that are located shortly after a political transition with the same frequency in other periods. We refer to these other periods as "non-political", while recognizing that even then the turnover may result from some political influence. Nevertheless, in the presence of heavy political influence we should expect the frequency of CB governor changes to be significantly higher in periods immediately after political transitions ("political periods") than in non political periods. The tests presented in the paper suggest that this is indeed the case for the entire sample of 64 countries, for the subgroup of developing countries and, surprisingly, for the industrial economies as well. Given this result, the frequency of CB governor changes in political periods can be used as an index of the extent of political influence over the CB, which leads to more refined indicators of CB autonomy.

To answer the second question we divide the periods following political transitions into a number of short intervals and calculate the frequency of changes at the CB within each interval. These frequencies are initially high and usually decrease with the length of the lag period. To find the cutoff between political and non-political periods we focus on the largest lag interval for which: 1) the frequency of changes at the CB within this interval is significantly higher than the frequency at lags of ten or more months and; 2) The frequencies in all intervals beyond this one do not significantly differ from the frequency in the ten-or-more months interval. The demarcation line between political and non political periods is then defined as the upper bound of the critical lag interval. With this procedure periods within six months of the latest political transition are defined as political in the overall sample and in most subsamples, and any period beyond that is non political.

The third question is handled by calculating a measure of political vulnerability of the CB and by examining its relation with a country's level of development and the nature of its regime (always democratic, always authoritarian or mixed). Vulnerability of the CB is defined as the fraction of political transitions that are followed, within the subsequent political periods, by a replacement of the CEO of the bank. It is then used on a country by country basis in order to answer the fourth question regarding possible interactions between CB vulnerability and economic performance.

Frequent removal from office of the bank's CEO following political transitions probably reflects gross political influence, since his term in office is not shielded by law or custom from political changes. This type of influence is more common in developing than in industrialized economies and, within the first group, is particularly high in countries that

switch between democratic and authoritarian regimes. Political influence on the CB also exists in countries where the index of political vulnerability of the CB is low or zero, but it is likely to be more subtle and, therefore, milder.[3]

The paper is organized as follows. Section II presents the data set and discusses the conventions used to organize it. The procedure for distinguishing between political and non political CB governor changes is developed and applied to the full sample of countries in section III. Section IV performs the same exercise for broad subgroups of countries and generally compares the lag profiles of estimated probabilities of change at the CB across subgroups. An appendix to this section ranks countries by their frequencies of political CB changes. Section V develops indices of CB political vulnerability for broad subgroups of countries and investigates the effect of different types of political transitions on CB vulnerability. An appendix to this section ranks individual countries by the political vulnerability of their central banks. The effects of vulnerability and of non political turnover on inflation, growth and real rates are briefly examined in section VI. Section VII estimates empirically how much of the strong cross sectional association between inflation and its variance is due to their common association with CB vulnerability and non political turnover.

II. THE DATA

To assess and quantify the degree of political influence on the CB we have put together a multi-country data set on political and on CB instability. Political instability is measured

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[3]A case in point is the U.S. in which the index of CB vulnerability is zero implying the non-existence of gross political influence. But, as documented in Havrilesky (1992), there are several other, milder, channels of political influence on the CB in the U.S.

by counting political transitions of various types. Instability at the CB is measured with data on the frequency and timing of replacement of CB governors. The research focuses on variables that were available from a large number of countries on a uniform basis.

Political transitions. Instability of the executive branch of government seems most relevant for central bank autonomy. Consequently we selected four types of political change as indicators of political instability: change of the head of government, change of the party in government, change of the fundamental rules of government as embodied in switches from authoritarian to democratic regimes or vice versa, and irregular changes of government from one authoritarian ruler to another. These types of changes form a hierarchy, so that each political event is coded as a single type - either a change of the head of government without change of party, a non-violent change of party without change of type of government, and an irregular change of (authoritarian) government without change of form of government (a coup), or a change of the form of government between democratic and authoritarian (a change in regime). We refer to these as low level, middle level, type-2 authoritarian, and high level political instability.

Our previous research indicated that the autonomy of the central bank differed markedly between industrial and developing countries (Cukierman, Webb,and Neyapti 1992). This paper therefore examines whether this distinction is also important for the effects of political instability on the central bank. Within each group, countries are further broken down into subgroups with democratic regimes for the whole period, with authoritarian regimes throughout, and with regimes that alternate between a democratic and authoritarian. We classified as democratic only the countries and periods in which the head of government was

chosen as a result of competitive elections. The classifications thus differ somewhat from what one would code as the degree of political liberty, such as with Gastil's indices. We chose to exclude from our data political events that challenged and perhaps threatened to change a government but did not do so – strikes, riots, attempted coups, and elections where the previous government was reelected. To assess the implications for an institution like the central bank, it seemed better to focus on institutionally well-defined events that actually changed the government to which the bank reported.

Changes at the central bank. The raw data on instability at the CB consists of the actual dates of changes of the CEOs of the central banks in over sixty countries between 1950 and 1989. CB governors' turnover is only an imperfect indicator of actual CB independence in developing countries (For more discussion of this proxy, see Cukierman, Webb and Neyapti, 1992; chapter 19 of Cukierman, 1992; Cukierman, Kalaitzidakis, Summers and Webb, 1993). Low turnover does not always imply a high level of CB independence - a relatively subservient governor may stay in office longer precisely because he does not stand up to the executive branch. This may be true for countries with exceptionally low turnover rates such as Iceland, Denmark Britain and the U.S. In such countries turnover is probably unrelated to independence. On the other hand, it is very likely that above some critical turnover rate, CB independence is lower the higher the turnover rate of the governor. One reason is that for sufficiently high turnover rates the tenure of the CB governor is shorter than that of the executive branch. This makes the governor more susceptible to influence by the executive branch and more discouraged from trying to implement longer-term policies. Since in most countries the electoral cycle is at least four years, it is likely that the threshold turnover is

somewhere between 0.2 and 0.25 (average tenure of four to five years). In addition, for very short terms of office, such as three years or less, it is generally more difficult to implement long term policies (such as the maintenance of price stability) for any electoral cycle. One limitation of the turnover variable is that all the industrial countries have turnover rates at or below the critical rated in the period we examine, whereas turnover rates in developing countries span a range that goes well above the critical point.

The measures of political influence on the CB developed here do not rely on turnover alone. They also capture the degree of political influence by examining the links between political instability and subsequent turnover at the CB. Hence the measures appear to be appropriate for both industrial and developing economies. They also make it possible to distinguish between the frequencies of changes at the CB in political periods and in non political periods. A relatively high level of the first frequency indicates substantial influence of political instability on the CB. A relatively high level of the second frequency does not indicate that, but at least beyond some threshold a high non political CB governors' turnover most likely indicates that the CB is more dependent.

Sample coverage and procedures. The sample consists of 64 countries with matched data on political and on CB instability. It includes all the major industrial and developing countries, but excludes most East Bloc countries.[4] The data cover 1950-89, where possible, but start later for countries that achieved political independence or established a central bank after 1950. The data are divided into two sub periods: 1950-71, corresponding to the Bretton Woods era, and 1972-89. In each sub period as well as in the total period, a country

[4]Appendix table A2 lists the countries.

is included only if data are available for at least 10 years. With shorter periods, the data would quite likely be unrepresentative.

There are instances where a given CB governor change occurs within the political span of two or more previous political transitions. In such cases the CB change is attributed only to the most recent political transition.

III. POLITICAL VERSUS NON POLITICAL CENTRAL BANK INSTABILITY - FULL SAMPLE EVIDENCE

To what extent does political instability translate into instability at the central bank? Are there systematic differences in central bank turnover between political periods (those immediately following a political change) and non-political periods? If there are differences, how does their magnitude vary with country characteristics? To answer the question this section measures political instability by the frequency of political transitions, as defined in the previous section, and instability at the central bank by the turnover of the governors.

Before attempting to give precise answers to these questions it is instructive to take a broad look at the data. Table 1 presents CB turnover figures (measured as the number of CB governor changes per unit of time, where time is measured in bi-monthly units) for various time periods following a political transition, for 64 countries between 1950 and 1989. Thus, the overall frequency of governors' changes within the same month or one month following a political transition is 0.142. The same frequency within two to three months following a political transition is 0.054 and it is only 0.024 in periods which are located at least ten months after a political transition. These numbers correspond to average terms of office of

1.2, 3.1 and 6.9 years respectively.[5]

TABLE 1: FREQUENCIES OF CB GOVERNORS' CHANGES AT VARIOUS LAG INTERVALS FOLLOWING THE LATEST POLITICAL TRANSITION - FULL SAMPLE

Lag interval in months	0-1	2-3	4-6	7-9	10 or more
Frequency (per two months)	0.142	0.054	0.052	0.028	0.024

The numbers in Table 1 can be interpreted as estimates of the probability of one CB governor change conditional on being within a time segment that follows a political transition by i to i+2 (or by i to i+3) months.[6] Table 1 reveals that, for the entire sample of countries, this probability decreases monotonically with the number of months that have elapsed since the last political transition. It is almost three times larger in time segments that are zero to one month following a political transition than in time segments that are two to six months after a political transition. This probability drops further -- to about a half of its value in the 2-6 months time segments -- for time periods seven or more months after a political transition.

Time periods within zero to one months of a political transition are highly likely to be

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[5] Let x be a turnover number from Table 1. Then, the corresponding average term in office, in years, is given by 1/6x.

[6] This interpretation requires the probability of two or more changes within the subperiod to be negligible. Since the basic time unit -- two months -- is short, this assumption is supported by the data.

political while time periods that are located more than nine months after a political transition are likely to be non-political. The classification of periods into political and non-political for intermediate lag intervals is murkier. To find the cutoff lag between political and non-political periods we assume that periods which are at least ten months after a political transition are certainly non-political and compare the estimated probability of a governor change within that period with the probabilities estimated for shorter lags. We then classify as political all time periods that are located up to nine months after a political transition, provided that their estimated probabilities of governor changes differ significantly from this probability in the (non-political) ten-or-more period. Time periods in the 0-9 months lag range are classified as non-political if the estimated probability does not significantly differ from that of the ten or more range.

To test for possible differences between the probability of CB governor change in the ten-or-more lag periods and each of the shorter lag intervals in Table 1, we use the normal approximation to the binomial distribution. More specifically let c_i and c_{10} be the number of CB governor changes in time interval i following a political transition and in the ten or more lag range respectively. As in Table 1, i may assume the interval values [0,1], [2,3], [4,6], [7,9] and 10 or more. We shall denote each of these lag intervals by its lower bound. Thus i assumes the values 0, 2, 4, 7 and 10. Let n_i be the number of periods within lag interval i in the sample. The frequency of CB governor changes within lag interval i is given by

$$f_i = c_i / n_i \quad \text{for} \quad i = 0,2,4,7,10. \tag{1}$$

Let P_i be the true conditional probability of a CB governor change in lag interval i following a political transition. The null hypotheses to be tested are

$$H_o: \quad P_i = P_{10} \text{ for } i = 0,2,4,7 \tag{2}$$

against each of the alternative hypotheses that P_i is significantly larger than P_{10}. The specification of the alternative hypotheses accommodates the possibility that the probability of a turnover at the CB is larger at shorter lags following a political transition. Under each of the null hypotheses the values

$$z_i \equiv \frac{f_i - f_{10}}{\sqrt{\bar{f}_i(1-\bar{f}_i)[\frac{1}{n_i} + \frac{1}{n_{10}}]}}, \quad i = 0,2,4,7 \tag{3a}$$

where

$$\bar{f}_i = \frac{c_i + c_{10}}{n_i + n_{10}}, \quad i = 0,2,4,7 \tag{3b}$$

have approximately a standard normal distribution, provided both n_i and n_{10} are larger than 30.[7] (See, for example Huntsberger, Croft and Billingsley (1980), p.302). The null hypotheses should be accepted for small values of the z_i's and rejected for large positive z_i's. Table 2 displays these statistics. Since a z_i of 3 implies that the null is rejected at the 0.001 level we conclude that the probabilities of a turnover at the CB are significantly larger for the 0-1, 2-3, 4-6 lag periods than for the 10-plus lag periods. However, there is no significant difference in the probability of a CB governor change between the 7-9 lag period and the 10-plus lag period. The evidence in Table 2 therefore supports the conclusion that

[7] These conditions are always satisfied for the entire sample of countries. For $i = 0,2$, n_i and n_{10} are the numbers of two months periods in the appropriate intervals. For $i = 4,7$ they refer to the number of three monthly periods. This variation in the length of the basic time unit is introduced to make its length identical to the length of the time period within each lag interval (2 months for $i = 0,2$ and 3 months for $i = 4,7$)). In either case the value of n is sufficiently large to make the normal approximation to the binomial valid.

the cutoff between political and non political periods occurs at a lag of six months following a political transition. Accordingly we define periods of up to six months following a political transition as political and periods which are located seven or more months after the latest political transition as non-political. The respective frequencies are 0.040 and 0.012 respectively. The z statistic testing the significance of the difference between these two estimated probabilities is a huge 12.2.

TABLE 2: VALUES OF THE TEST STATISTIC FOR THE NULL H_o; $P_i = p_{io}$ - FULL SAMPLE

Lag Interval (months)	0-1	2-3	4-6	7-9
z_i	15.3	4.1	4.5	0.6

In summary, for the entire sample of countries the evidence supports the view that instability at the CB rises in periods following political transitions and that this increase is significant. Furthermore the most likely cutoff between political periods, with a relatively high probability of a change in governor, and non political periods with a lower probability is six months following the latest political transition. Finally, the estimated probability of a change at the CB is more than 3 times larger in periods that have been identified as political than in periods that have been identified as non political. These results taken together suggest that the chief executive officers of central banks are, on average, more likely to be replaced after political transitions than in other periods. Thus, political instability increases instability at the central bank and weakens its independence from political authorities.

IV. POLITICAL VERSUS NON-POLITICAL CENTRAL BANK INSTABILITY BY

BROAD COUNTRY SUBGROUPS

This section examines how the profile of estimated probabilities of a change at the CB varies between industrial and developing countries. Within each of these groups, countries are disaggregated further by type of regime: countries with democracy the whole time, countries with authoritarian regimes the whole time, and countries alternating between a democratic and an authoritarian regime (mixed regime). Most industrial countries are democratic for the whole time. There are no authoritarian-only countries within this group during the period under investigation, and only two (Spain and France) who belong to the mixed-regime group. Developing countries include all three subgroups -- democratic-only, authoritarian-only, and mixed.

Table 3 presents the estimated probabilities of CB governor changes at various lags following a political transition for the different subgroups of countries. We first focus on the profiles of estimated probabilities of industrial and developing countries. These probabilities are higher in developing countries than in industrial countries at all lags following a political transition. The frequencies decline monotonically for developing countries but have two peaks for industrial countries -- one in the initial 0-1 interval and a second lower peak in the 4-6 month interval. A replication of the tests of the previous section for each group separately reveals that for developing countries the appropriate cutoff between political and non political periods is still at the upper end of the 4-6 months interval. The z statistics for testing the null hypotheses $P_i = P_{10}$ for $i = 0,2,4,7$ are 15.5, 4.9, 4.4 and 1.4 respectively. The z statistic of the null that the frequency within the entire 0-6 months interval is no different than this frequency in periods that are seven or more months after a

political transition is a huge 12.4. Thus there is clear evidence of a link-running from political instability to instability at the CB, as well as an estimate of the cutoff between political and non political periods in developing countries.

TABLE 3: FREQUENCIES OF CB GOVERNOR CHANGES AT VARIOUS LAG INTERVALS BY SUBGROUPS OF COUNTRIES[a]

Country Group	No.of countries	No.of months since a political transition 0-1	2-3	4-6	7-9	10 or more
Industrial:						
All	19	0.058	0.015	0.028	0.008	0.014
Democ. only	17	0.049	0.017	0.031	0.004	0.014
Mixed	2	0.130	0.000	0.000	0.059	0.019
Developing:						
All	45	0.205	0.083	0.070	0.043	0.030
Democ. only	8	0.122	0.000	0.139	0.000	0.011
Author. only	21	0.196	0.037	0.013	0.053	0.024
Mixed	16	0.218	0.108	0.078	0.046	0.029

The evidence is less dramatic for industrial countries but still supports the view that in those countries the probability of a change at the CB in the 0-1 month interval is significantly higher than in the ten-plus interval. Although there is no significant difference between the frequencies in the 2-3 month interval and in the ten-plus interval within the group of industrial countries, the difference in frequencies between the next, 4-6 interval, and the ten plus interval is significant at roughly the 0.03 level. However, there is no significant difference in frequencies between the ten-plus interval and the 7-9 month interval. Thus for industrial economies we could locate the cutoff between political and non political periods either after the 0-1 interval or after the 4-6 interval. In the first case the z statistic is 4.9

and in the second 3.75 (both significant at the 0.001 level).[8] To maintain compatibility with developing countries, most of the subsequent discussion uses the six-month cutoff.

The frequencies of CB turnover within the three subgroups of developing countries is summarized in the lower part of Table 3. In all three, the frequencies in the 0-1 month interval are substantially higher than in the subsequent intervals. Statistical tests reveal that in all three cases the difference in frequencies between the 0-1 month interval and the 10-plus interval is significant. Comparing the three subgroups, the average frequency of CB instability in the 0-1 month interval is highest on average in the countries with mixed regimes, second highest in authoritarian-only countries, and lowest in democratic-only developing countries.[9]

The tendency of mixed regimes to have higher frequencies than democracies in the 0-1 range also appears within the industrial countries, although this finding is based on a sample of only two mixed industrial countries, Spain and France. Also, as was the case for industrial democracies, there is a second peak in the 4-6 month interval for democratic-only developing countries.

Appendix Table A1 presents the frequencies of CB turnover for individual countries for both political periods (up to 6 month following a political change) and non-political periods. Countries are classified into the same subgroups as in Table 3. Within each subgroup they are arranged in ascending order of the frequency of political CB governor changes. The

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[8] The results are qualitatively similar when the same tests are repeated for the democratic-only industrial countries and for the 0-1 month time interval.

[9] But the corresponding frequency in the group of industrial democracies is even smaller.

basic time unit in the table is six months. Thus, a number such as 0.428 for Sweden means that the average probability of a CB governor change in a political six-month period is 0.428. The same probability in non-political periods is about one-eighth as large - a mere 0.053. The ranges of estimated probabilities for political periods start at zero in all subgroups. But the upper bounds of the ranges differ. They are 0.43 for industrial democracies, 0.52 for authoritarian developing countries, 0.855 for democratic developing countries and over 1 in the group of developing countries with mixed regimes.[10] As noted before, these ratios indicate gross political interference with the CB but do not capture more subtle influences. A full discussion of the implications of differences in gross political interference follows the development of a more sophisticated indicator.

V. A MEASURE OF THE POLITICAL VULNERABILITY OF CENTRAL BANKS

The frequency of CB turnover in political periods reflects both the frequency of political change and the fraction of political changes that are followed by central bank changes. In fact, it is the product of these two numbers. While the frequency contains useful information, but is also useful to measure the vulnerability of central banks in a way that nets out the effect of the number of political changes. The indicator of the political vulnerability of the CB is defined for each country as the fraction of political transitions that are followed promptly by a replacement of the CB governor:

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[10] The reported frequency can be interpreted as an estimate of the probability of change, subject to the qualification that there is not more than one change in any six-months period. This qualification is satisfied for most countries and time periods. The actual frequency of CB governor change in political periods is larger than one per 6 months in only one country, Argentina.

$$V(i) \equiv \frac{\text{Number of CB governor changes with i months following a political transition}}{\text{Number of political transitions}}, \quad i = 1,6.$$

Table 4 reports average values of the index of CB political vulnerability for industrial and for less developed countries as well as for democratic, authoritarian and mixed regimes within each group. The overall average value of vulnerability is 0.24, i.e., a little less than a quarter of all political transitions are followed by a replacement of the CB governor within 6 months. As with the frequency of turnover, the vulnerability varies widely across country groups and subgroups. Political vulnerability is over three times larger in developing countries than in industrial countries. A similar picture (not shown) emerges when the sample is broken into two subperiods (50-71 and 72-89). Central banks of developing countries with mixed regimes are the most vulnerable.

TABLE 4: POLITICAL VULNERABILITY OF CENTRAL BANKS BY COUNTRY GROUPS, 1950-1989

Country Group	Vulnerability		Frequency of Political change (per annum)
	Within 6 months	Within 1 month	
All	0.24	0.13	0.26
Industrial	0.10	0.05	0.31
Developing	0.34	0.19	0.24
Industrial:			
Democratic only	0.10	0.05	0.30
Mixed	0.12	.12	0.33
Developing:			
Authoritarian only	0.22	0.18	0.15
Democratic only	0.28	0.10	0.17
Mixed	0.38	0.20	0.31

The last column of Table 4 reports the average frequency of political transitions per annum for each country group. Industrial countries have more frequent political transitions than developing countries, because they have much more frequent democratic changes of government, with and without party changes. Within developing countries, the subgroup with mixed regimes has a frequency of political transitions that is about twice that of either democratic only and authoritarian only countries. The latter two have less frequent political changes of any type.

How is the political vulnerability of the CB affected by the type of political instability in a country? To answer this question we regressed the indices of CB vulnerability at 0-1 month and 0-6 month lags on various types of political transitions and on an dummy for

developing countries and a dummy for purely authoritarian regimes.[11] Table 5 summarizes the results. For the 0-6 months index of vulnerability, the developing-country dummy has a significant positive impact on CB vulnerability, and high-level political instability also does.[12] These effects show up more weakly with the vulnerability index for the 0-1 month interval.

The vulnerability of central banks to political influence depends on the type of political transition. Table 6 reports the indices of political vulnerability by type of political transition for different country groupings. The fraction 0.61 at the intersection of the developing countries row with the "high level" column means that sixty one percent of high level political transitions in developing countries are followed, within six months, by a replacement of the CB governor. The numbers in the other cells are defined in a similar manner.[13] There is generally little difference between the vulnerability to middle level and to low level political transitions, within each country group. The vulnerability to middle and low level political transitions is more than twice as high in developing countries than in industrial countries. Furthermore this difference seems to be due to the difference in the

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[11] The estimated equation is a pooled cross-section time series regression in which there are two observations for each country, one for the 1950-71 period and the other for the 1972-89 period.

[12] The regression with the index of vulnerability for a 0-1 month lag gave qualitatively similar results but with less statistical significance. Since, at least for developing countries, V(6) is a more appropriate measure of vulnerability than V(1), the better fitting regression is also more relevant. The effect of high level political instability is statistically significant if Switzerland is omitted from the sample, which would be reasonable on grounds that the annual change of head of government from the representative of one canton to the next does not reflect a political change in the sense it would elsewhere.

[13] Some of the cells are empty because, by definition, not all types of political transitions occur in all country groups. For example, in always democratic countries there are no high level and authoritarian type 2 political transitions, by definition.

level of development, rather than to differences in regimes, because vulnerability of democratic developing countries to middle and low level political transitions is more than twice as large as that of industrial democracies. The vulnerability of mixed developing countries to these types of political transitions is of the same order of magnitude as the vulnerability in democratic developing countries.

TABLE 5: CENTRAL BANK VULNERABILITY AND POLITICAL CHANGE, 1950-89

Explanatory Variable	Dependent Variable = Vulnerability	
	0-1 month lag	0-6 month lag
Constant	0.095	0.150
	(1.62)	(2.00)**
High level	0.72	1.23
Political change	(1.36)	(1.76)*
Authoritarian-2	-0.22	-0.47
Transitions	(-0.39)	(-0.63)
Mid-level	-0.16	-0.20
Political change	(-0.94)	(-0.89)
Low level	-0.10	-0.16
Political change	(-0.49)	(-0.58)
Dummy	0.032	-0.047
Authoritarian	(0.43)	(-0.48)
Dummy	0.097	0.22
Developing	(1.49)	(2.53)**
Number of Observations	104	104
R-square Adjusted	0.053	0.131

T-statistics in parentheses
* means significant at 10 percent level
** means significant at 5 percent level
*** means significant at 1 percent level.

TABLE 6: CENTRAL BANK VULNERABILITY (WITHIN 6 MONTHS) BY TYPE OF POLITICAL TRANSITION AND COUNTRY GROUP

Country group	Type of Political Transition*			
	High Level	Authoritarian-2	Middle Level	Low Level
Industrial	0.00	NA	0.10	0.11
Developing	0.61	0.46	0.25	0.26
Industrial:				
Democratic	NA	NA	0.10	0.10
Mixed	0.00	NA	0.12	0.17
Developing:				
Authoritarian only	NA	0.20	NA	0.23
Democratic only	NA	NA	0.29	0.27
Mixed	0.61	0.56	0.24	0.28

NA = not applicable, because there were no transitions of that type for that category of country.

* The definitions of type of political transitions are:
1) High level - change of regime, from democratic to authoritarian or vice versa,
2) Authoritarian 2 - replacement of one authoritarian regime by another one,
3) Middle level - change of party without a change in regime,
4) Low level - change of head of government without change in regime or party.

Within developing countries, CB vulnerability to authoritarian-2 transitions is larger than vulnerability to middle and low level transitions by a factor of almost two. The 0.46 figure for vulnerability to authoritarian-2 transitions masks quite different tendencies in authoritarian and in mixed developing countries. While vulnerability is only 0.2 in the first group, it is 0.56 in the second. The highest level of CB vulnerability occurs in the face of high level political transitions within developing countries with mixed regimes.

Table A2 in the appendix presents the vulnerability of central banks to all types of

political transitions for individual countries by subgroups. Within each subgroup central banks are arranged in descending order of their political vulnerability. By this measure Sweden has the most politically vulnerable CB among industrial democracies. Among democratic-only developing countries, the CB of Botswana is the most vulnerable, and among developing countries with mixed regimes the Argentine CB is the most vulnerable.

VI. EFFECTS OF CB VULNERABILITY AND OF NON-POLITICAL TURNOVER ON THE ECONOMY

Besides being of independent interest, behavioral measures of CB autonomy are useful for testing the effect of this autonomy, or its absence, on the economy. Such a project is largely beyond the scope of this paper. Nevertheless, this and the next section briefly report evidence on the relation between some of our measures and the performance of the economy as reflected by inflation, real growth, and real interest rates.

Each of these variables is regressed in pooled cross-section time series on CB vulnerability, on non-political turnover, and on other control variables. Non-political turnover is measured as the average number of non political governor changes (more than six months after the latest political transition) per annum.

Inflation. Previous work has established the existence of a significant positive relationship between the rate of depreciation in the real value of money (D) and the (total) turnover of CB governors for developing countries (Table 7 of Cukierman, Webb and Neyapti (1992) and Table 20.2 in Cukierman (1992)).[14] Table 7 here extends the effort by

[14] $D = \pi/(1+\pi)$, where π is the annual inflation rate.

relating D and its standard deviation to the index of vulnerability, non-political turnover, various types of political instability and three dummies: one for the Bretton-Woods era, one for having only authoritarian regimes in the period, and one for developing countries.[15] This formulation makes it possible to evaluate whether political instability leads to inflation only by reducing CB autonomy or also directly. The first regression in Table 7 backs the view that both channels are important.

[15] The sample consists of two observations on each country. One for the 1950-71 period, corresponding to the Bretton Woods era, and the other for the 1972-89 period.

TABLE 7: INFLATION AND INSTABILITY AT THE CENTRAL BANK AND POLITICS, 1950 - 89

Explanatory Variable	Dependent Variable Inflation Transformed (D)	Standard Deviation of D
Constant	0.042 1.55	0.014 (1.01)
Vulnerability (lag 0-6 months)	0.088 (2.62)***	0.065 (3.68)***
Non-Political Turnover (lag over 6 months)	0.26 (2.65)***	0.13 (2.52)**
High level Political change	0.36 (1.63)	0.29 (2.48)**
Authoritarian-2 Transitions	0.28 (1.24)	0.16 (1.35)
Mid-level Political change	0.042 (0.60)	0.008 (0.225)
Low-level Political change	0.14 (1.73)*	0.047 (1.07)
Dummy Authoritarian only	0.034 (1.08)	0.027 (1.66)*
Dummy first period (1950-71)	-0.082 (-4.11)***	-0.016 (-1.56)
Dummy Developing	-0.013 (-0.43)	-0.009 -(0.59)
Number of observations R-square Adjusted.	104 0.333	104 0.358

T-statistics in parentheses
* means significant at 10 percent level or lower
** means significant at 5 percent level
*** means significant at 1 percent level.

In particular the political vulnerability of the CB as well as non political turnover at the bank have a positive and significant impact on inflation (D). Political instability, particularly of the high levels, contribute to increased inflation, as expected, although not as much as the CB variables. Also, world-wide inflation is lower during the Bretton-Woods period, even after allowing for the effect of other variables. This is consistent with the view that fixed exchange rates have a stronger disciplining effect on policy than flexible rates. But it may also be due to the larger shocks that affected the world economy in the post Bretton-Woods period.

The most important result in Table 7 is the insignificance of the dummy variable for developing countries. Inflation is higher on average in developing countries, and this could not be accounted for by just looking at the overall frequency of turnover at the central bank (Cukierman, Webb, and Neyapti 1992). Once turnover is disaggregated into its constituent parts, however, and account is taken of the different types of political instability, the distinction between developing and industrial countries no longer contributes to explaining differences in inflation outcomes. In other words, the differences in vulnerability of the central bank to political instability, in CB turnover in non-political periods, and in political instability can fully account for the developing countries having higher average inflation than industrial countries. Similarly, having an authoritarian regime throughout does not help significantly to explain differences in average inflation, once the central bank and political variables are taken into account.

The variability of inflation, measured by the standard deviation of D, is also positively and significantly related to CB vulnerability and to non-political turnover. The frequency of

high-level political change also had a positive and significant effect on the standard deviation of D.

Growth. Recent empirical literature on growth has identified a number of variables such as initial GDP and education that are significantly related to real growth (see Barro (1991) for example). Does the degree of anti-inflation commitment by the monetary authorities, for which our indices of CB autonomy are a proxy, have any significant impact on growth after controlling for these variables? Table 8 answers this question by presenting growth equations that take account of initial GDP, initial primary and secondary education enrollment ratios, a decade by decade change in terms of trade, as well as our indices of CB autonomy.[16] With a full sample of countries, neither of the central bank variables is significant. Brazil, Korea, and Botswana are outliers, however, because they achieved high growth despite high rats of central bank turnover indicators of vulnerability. With those countries excluded, both indicators of political influence on the central bank have a negative coefficients in the growth regression.[17] This finding supports the view that, other things being equal, higher political dependence of the CB retards growth. It is possible that political vulnerability of the CB is a proxy for general economic and political instability, both of which deter growth possibly by slowing down investment and innovation.

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[16] The sample consists of, at most, three decade observations on each country.

[17] Botswana could be legitimately be discarded from the sample, because it growth was primarily due to the discovery of diamonds, not to good macroeconomic policy. Brazil ad Korea seem to be simply countries where lack of central bank autonomy was not a hinderance to growth, at least not in the period covered here.

TABLE 8: GROWTH EQUATIONS WITH CENTRAL BANK VULNERABILITY AND NON POLITICAL TURNOVER: 1960-1988

	Full Sample	Sample minus Three[a]
Constant	-.15 (-.15)	0.73 (0.77)
Initial GDP	-.22 (-2.46)**	-0.25 (-2.83)***
Change in Terms of Trade	28.9 (4.87)***	28.1 (5.01)***
Initial primary education enrollment ratio	2.03 (1.98)**	2.53 (2.55)***
Initial secondary education enrollment ratio	1.59 (1.22)	1.34 (1.04)
Non-political turnover of CB governors	5.80 (1.80)*	-2.39 (-0.66)
Political vulnerability of CB	-.78 (-1.15)	-1.51 (-2.30)**
Dummy for the sixties	1.69 (3.01)***	1.42 (2.61)***
Dummy for the seventies	1.39 (2.74)***	1.11 (2.26)**
Adj. R^2	0.23	0.26
Number of observations	129	120

Pooled cross section-time series (decades). CB vulnerability is characterized in terms of CB governor changes that occur within six months of a political transition. t statistics are in parentheses under the coefficients.

[a] Botswana, Brazil, and Korea, are excluded.

* designates significance at the 0.10 level
** designates significance at the 0.05 level.
** designates significance at the 0.01 level.

There is also some evidence that in developing countries, higher CB vulnerability is associated with lower levels of investment (Cukierman, Kalaitzidakis, Summers and Webb, 1993). Sorting out the channels through which political vulnerability affects growth clearly deserves further work.

Real deposit interest rates. Previous evidence (Alesina and Summers (1993) and Cukierman, Kalaitzidakis, Summers and Webb (1993)) suggests there is a negative relation between the variability of ex-post real interest rates and CB independence. In this work CB independence is proxied by legal independence for developed countries and CB governors' turnover for developing countries. We now reexamine this finding with CB vulnerability and non-political turnover as proxies for lack of CB independence. The second column of Table 9 presents the result. It appears that both CB vulnerability and non-political turnover significantly increase the variability of ex-post real deposit rates. This further supports and amplifies the conclusion that the variability of ex-post real deposit rates is lower in countries with more independent central banks. Although it has the expected negative sign, the coefficient on legal independence is not significant.

The first column in Table 9 relates the average level of the ex-post real deposit rate to measures of CB independence. The higher the political vulnerability of the CB the lower the average real deposit rate, which corroborates a similar finding in Cukierman, Kalaitzidakis, Summers and Webb (1993). It probably reflects the higher implicit taxation of financial savings in countries with more politically dependent central banks.

TABLE 9: THE EX-POST REAL DEPOSIT RATE

AND ALTERNATIVE MEASURES OF CENTRAL BANK AUTONOMY

Explanatory Variable	Dependent Variable	
	Real Ex-Post Deposit Rate (R)	Standard Deviation of R
Constant	1.98 (0.64)	1.04 (0.3)
Vulnerability (lag 0-6 months)	-5.56 (-1.89)*	8.68 (2.1)**
Non Political turnover (lag over 6 months)	-1.98 (-.15)	36.24 (3.0)***
Legal CB independence	-3.26 (-.48)	-5.60 (-0.7)
Number of observations	34	34
R^2 adjusted	0.05	0.52

T-Statistics are in parentheses under the coefficients.

* means significant at 10 percent level
** means significant at 5 percent level
*** means significant at the 1 percent level.

The ex-post real deposit rate is from Easterly, Rodriguez and Schmidt-Hebbel (1992). Details on the construction of legal independence appear in Cukierman, Webb and Neyapti (1992) and in chapter 19 of Cukierman (1992).

VIII. THE MEAN AND THE STANDARD DEVIATION OF INFLATION AND THEIR COMMON ASSOCIATION TO VULNERABILITY AND NON POLITICAL TURNOVER

The strong cross country association between the mean and the variability of inflation is a well-known empirical regularity. Using legal independence and (total) CB governors' turnover as proxies for CB independence, up to a quarter of this association is accounted for by their common association with CB independence (Cukierman 1992, chapters 18 and 22). For this paper, the same experiment was repeated with CB vulnerability and non political turnover as (alternative) indices of CB autonomy. In addition, legal independence was added as a regressor in industrial countries.[18] To calculate the fraction of the correlation between the mean and the standard deviation of inflation that is due to their common association with central bank independence we proceeded as follows. First the cross sectional covariance between D (the rate of depreciation in the real value of money) and its standard deviation was calculated. Second, both D and its standard deviation were regressed on CB vulnerability, non-political turnover and (for industrial countries) legal independence, and the predicted values of D and of its standard deviation were calculated. Third, the covariance between those predicted values was calculated and compared to the overall covariance between D and its standard deviation.

The experiment was done for the entire 1950-89 period and for the subperiods 1950-71 and 1972-89. The fractions of the covariability between D and its standard deviation due to their mutual link to CB independence are: 0.30 for the whole period and 0.40 and 0.31 for

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[18] For details on the construction of the index of legal independence see Cukierman (1992) chapter 19 or Cukierman, Webb and Neyapti (1992).

the two sub-periods. Thus, with the more refined measures of CB autonomy presented in this paper, about one third of the association between inflation and its variability is due to their common association with CB independence.

VIII. CONCLUDING REMARKS

Stability and other characteristics of government institutions have always been recognized in economic history and in country studies as crucial determinants of macroeconomic stability. Recently this recognition has spread to theoretical work on macroeconomics and has been the focus of some cross-country statistical analysis (Fischer (1991), Edwards and Tabellini (1991), Cukierman, Edwards, and Tabellini (1992), Alesina, Ozler, Roubini, and Swagel (1991), Haggard and Kaufman and Webb (1992). A survey appears in Alesina and Perotti (1993)). As one would expect, political instability is positively related to inflation and negatively related to growth. There are various theories for how political instability causes macroeconomic instability, most of them not mutually exclusive. One contender is that political instability shortens time horizons of policy makers and that it decreases the ability of the political system to efficiently resolve disputes over real incomes.

This paper has demonstrated that political instability causes instability at the CB as well. But the spillover from political instability to instability at the CB varies across country groups and types of political transitions. It is particularly large when the regime changes from democratic to authoritarian or vice versa. This supports the view that when political change is deep enough to involve fundamental rules of the game and in other circumstances

where political change would probably mean the party in power would not be back soon, if ever, then the expected effect of greater political instability would be shortened time horizons, as discussed above, and therefore less autonomy and stability for the central bank. Each new government would want to use the central bank to try to stay in power as long as possible, and would have little concern for the associated detrimental longer run effects. Greater frequency of low- and medium-level political change, however, -- just changing the head of government or the party -- does not on average lead to reduced central bank autonomy as proxied by its political vulnerability.[19]

An important issue for future work is the possibility of reverse causality between the performance of the economy and our measures of gross political influence on the CB. The largely cross-sectional nature of our data precludes the use of Granger-Sims and other methods to test the exogeneity of our measures of political instability with respect to the performance of the economy. Hence, strictly speaking, it is possible that some of the significant relationships between these two groups of variables are due to causality running from the economy to political influence.[20]

The measure of CB vulnerability, however, is more likely to be exogenous with respect to the economy than other behavioral indices of political influence on the CB. Even if

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[19] Actually in democratic governments where the party changes frequently, the ruling party might typically lack the strength to impose its will unilaterally and might thus agree to a compromise that would endure changes of party. This was explicit in the set-up of the reformed Chilean central bank in 1989 (Arriagada and Graham (1993)). An analysis of the effect of political instability on CB independence in countries with democratic and stable rules of the political process appears in Cukierman (1994).

[20] This is probably less likely to be the case for real interest rates than for real growth. There is evidence that real growth is affected by political instability (Barro (1991), Alesina, Ozler, Roubini and Swagel (1991)) which may, in turn, cause instability at the CB.

political instability responds to the performance of the economy, vulnerability as defined here focuses on the ratio between instability at the CB and political instability. This ratio, which depends on institutions and socio-political norms, may be largely exogenous to the economic performance.

Since the main novelty of this paper is in the extraction of empirical regularities by matching two new data sets our approach has been inductive rather than deductive. We deliberately avoided committing to and testing a particular model since we believe that at this early stage the broad regularities in the data can be uncovered more efficiently without positing a particular model. Our hope is that the regularities uncovered here will encourage the construction of more precise models and further empirical testing of hypotheses.

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APPENDIX TABLE A1

Frequencies of Political and non Political Central Bank Governor Changes -- Individual Countries by Subgroups, 1950-1989 (*)

Country	(1) Political	(2) Non Political
INDUSTRIAL-DEMOCRATIC		
Norway	0.000	0.045
Canada	0.000	0.054
United Kingdom	0.000	0.057
United States	0.000	0.070
Austria	0.000	0.081
Belgium	0.065	0.062
Denmark	0.086	0.015
Netherlands	0.102	0.014
Finland	0.112	0.038
New Zealand	0.115	0.070
Ireland	0.156	0.060
Australia	0.172	0.040
Germany	0.214	0.040
Japan	0.222	0.075
Sweden	0.428	0.053
INDUSTRIAL-MIXED		
France	0.116	0.064
Spain	0.172	0.081
DEVELOPING-AUTHORITARIAN		
Qatar	NA	0.000
Tanzania	NA	0.064
Kenya	NA	0.085
Indonesia	NA	0.106
Zaire	0.000	0.120
Romania	0.000	0.128
Uganda	0.000	0.129
Morocco	0.086	0.101
Yugoslavia	0.095	0.119
South Africa	0.172	0.054
Taiwan	0.245	0.030

Hungary	0.286	0.031
Egypt	0.286	0.149
Mexico	0.429	0.041
China	0.429	0.141
Ethiopia	0.522	0.065
DEVELOPING-DEMOCRATIC		
The Bahamas	NA	0.096
Singapore	NA	0.184
Barbados	0.000	0.062
Israel	0.000	0.082
Malta	0.429	0.121
Western Samoa	0.429	0.240
Costa Rica	0.536	0.226
Botswana	0.855	0.180
DEVELOPING-MIXED		
Malaysia	0.000	0.042
Philippines	0.000	0.067
Pakistan	0.102	0.138
Ghana	0.143	0.111
Nigeria	0.146	0.077
Greece	0.158	0.066
Thailand	0.162	0.081
Nepal	0.169	0.100
Honduras	0.286	0.015
Colombia	0.286	0.072
Venezuela	0.286	0.130
Turkey	0.327	0.144
Panama	0.364	0.051
Poland	0.383	0.093
Portugal	0.406	0.089
India	0.500	0.125
Korea	0.571	0.135
Uruguay	0.612	0.187
Brazil	0.701	0.207
Chile	0.857	0.186
Argentina	1.294	0.222

(*) The frequencies are measured in terms of time units that are six months long.
NA - Not available.

APPENDIX TABLE A2
Political Vulnerability of Central Banks for Individual Countries by Subgroups, 1950-1989 (*)

Country	Vulnerability (within 6 months)
INDUSTRIAL-DEMOCRATIC	
Sweden	0.400
Japan	0.214
Germany	0.200
Ireland	0.167
Australia	0.167
New Zealand	0.111
Finland	0.111
Switzerland	0.110
Netherlands	0.100
Denmark	0.091
Belgium	0.067
Iceland	0.000
Austria	0.000
Norway	0.000
United Kingdom	0.000
Canada	0.000
United States	0.000
INDUSTRIAL-MIXED	
Spain	0.167
France	0.100
DEVELOPING-AUTHORITARIAN	
Indonesia	1.000
China	0.500
Mexico	0.429
Ethiopia	0.400
Hungary	0.333
Taiwan	0.286
Egypt	0.250
South Africa	0.167
Morocco	0.100
Yugoslavia	0.100

Tanzania	0.000
Uganda	0.000
Kenya	0.000
Romania	0.000
Zaire	0.000
Qatar	NA

DEVELOPING-DEMOCRATIC

Botswana	1.000
Costa Rica	0.556
Western Samoa	0.333
Malta	0.333
Barbados	0.000
Israel	0.000
The Bahamas	NA
Singapore	NA

DEVELOPING-MIXED

Argentina	1.375
Chile	0.800
Uruguay	0.714
Brazil	0.692
Korea	0.667
India	0.500
Poland	0.429
Panama	0.400
Turkey	0.375
Portugal	0.357
Colombia	0.300
Honduras	0.300
Venezuela	0.300
Nepal	0.182
Thailand	0.154
Nigeria	0.143
Greece	0.111
Pakistan	0.111
Ghana	0.111
Malaysia	0.000
Philippines	0.000

(*) Within each subgroup central banks are arranged in descending order of political vulnerability.

NA - Not available.

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